



# Spectral Gamma-Ray Borehole Log Data Report

Page 1 of 3

Borehole

# 11-03-02

Log Event A

## Borehole Information

Farm : <u>AX</u>	Tank : <u>AX-103</u>	Site Number : <u>299-E25-113</u>
N-Coord : <u>41,764</u>	W-Coord : <u>47,532</u>	TOC Elevation : <u>680.00</u>
Water Level, ft :	Date Drilled : <u>1/31/1975</u>	

## Casing Record

Type : <u>Steel-welded</u>	Thickness : <u>0.280</u>	ID, in. : <u>6</u>
Top Depth, ft. : <u>0</u>	Bottom Depth, ft. : <u>100</u>	

## Borehole Notes:

This borehole was drilled in January 1975. It was driven to 100 ft with 6-in. casing. The casing thickness is presumed to be 0.280 in., on the basis of the published thickness of schedule-40 carbon-steel pipe. The zero reference is the top of the borehole pipe, which is even with the ground surface.

## Equipment Information

Logging System : <u>1</u>	Detector Type : <u>HPGe</u>	Detector Efficiency: <u>35.0 %</u>
Calibration Date : <u>04/1996</u>	Calibration Reference : <u>GJPO-HAN-5</u>	Logging Procedure : <u>P-GJPO-1783</u>

## Log Run Information

Log Run Number : <u>1</u>	Log Run Date : <u>09/13/1996</u>	Logging Engineer: <u>Alan Pearson</u>
Start Depth, ft.: <u>99.5</u>	Counting Time, sec.: <u>100</u>	L/R : <u>L</u> Shield : <u>N</u>
Finish Depth, ft. : <u>82.0</u>	MSA Interval, ft. : <u>0.5</u>	Log Speed, ft/min.: <u>n/a</u>
Log Run Number : <u>2</u>	Log Run Date : <u>09/16/1996</u>	Logging Engineer: <u>Alan Pearson</u>
Start Depth, ft.: <u>83.0</u>	Counting Time, sec.: <u>100</u>	L/R : <u>L</u> Shield : <u>N</u>
Finish Depth, ft. : <u>4.0</u>	MSA Interval, ft. : <u>0.5</u>	Log Speed, ft/min.: <u>n/a</u>
Log Run Number : <u>3</u>	Log Run Date : <u>09/16/1996</u>	Logging Engineer: <u>Alan Pearson</u>
Start Depth, ft.: <u>4.5</u>	Counting Time, sec.: <u>100</u>	L/R : <u>R</u> Shield : <u>N</u>
Finish Depth, ft. : <u>0.0</u>	MSA Interval, ft. : <u>0.5</u>	Log Speed, ft/min.: <u>n/a</u>



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## Analysis Information

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Analyst : E. Larsen

Data Processing Reference : P-GJPO-1787

Analysis Date : 11/27/1996

### Analysis Notes :

This borehole was logged in three log runs. The pre- and post-survey field verification spectra met the acceptance criteria established for the peak shape and system efficiency, confirming the SGLS was operating within specifications. The energy calibration and peak-shape calibration from these verification spectra were used to establish the channel-to-energy parameters used in processing the spectra acquired during the logging operation.

Casing correction factors for a 0.280-in.-thick steel casing were applied during analysis.

The man-made radionuclides Cs-137, Co-60, and Sb-125 were identified in this borehole. The presence of Cs-137 contamination was noted continuously from the ground surface to a depth of 83 ft. Detectable quantities (less than 0.6 pCi/g) were also noted at depths of 84, 98.5, and 99.5 ft. The extensive zone of continuous Cs-137 contamination was detected within back-fill material (consisting of coarse-grained gravelly sand and silt) that overlies and surrounds the tank and within the undisturbed sediments (consisting of fine- to coarse-grained sand and gravel) that underlie the tank. The maximum Cs-137 concentration (about 2,000 pCi/g) was detected within the upper 5 ft of the borehole.

Detectable concentrations of Co-60 were detected continuously between 3.5 and 10.5 ft. The highest measured concentration of Co-60 within this zone was about 9 pCi/g at 3.5 ft. Detectable quantities of Co-60 (less than 2 pCi/g) were also encountered from 13 to 14 ft, 15 to 16 ft, and at 23.5 and 24.5 ft. Detectable concentrations of Sb-125 were noted at 10.5, 34.5, and 36 ft. The highest measured concentration was about 30 pCi/g at 10.5 ft.

The presence of Co-60 is indicated by the 1173- and 1333-keV spectral peaks. The presence of Sb-125 is indicated by the 463-keV spectral peak.

From the ground surface to 26.5 ft and 33.5 to 37.5 ft, it was not possible to identify the 609-keV peak used to derive the U-238 concentrations. This occurred because high gamma-ray activity associated with the nearby Cs-137 peak (661 keV) created an elevated Compton continuum extending to the 609-keV region, causing the MDL to exceed the measured U-238 concentration. From the ground surface to a depth of 4 ft, it was not possible to identify the 1460- and 2614-keV peaks used to determine the K-40 and Th-232 radionuclide assay, probably because the high 661-keV radiation associated with the Cs-137 contamination produced spectral distortions that caused the MDLs associated with the 1460- and 2614-keV peaks to exceed the measurable radionuclide concentrations.

Additional information and interpretations of log data are included in the main body of the Tank Summary Data Report for tank AX-103.

### Log Plot Notes:

Separate log plots show the man-made radionuclides (Cs-137, Co-60, and Sb-125) and the naturally occurring radionuclides (KUT). The natural radionuclides can be used for lithology interpretations. The headings of the plots identify the specific gamma rays used to calculate the concentrations.



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Page 3 of 3

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Uncertainty bars on the plots show the statistical uncertainties for the measurements as 95-percent confidence intervals. Open circles on the plots give the MDL of a radionuclide, which represents the lowest concentration at which positive identification of a gamma-ray peak is statistically defensible.

A combination plot includes the man-made and natural radionuclides, in addition to the total gamma derived from the spectral data and the Tank Farms gross gamma log. The gross gamma plot displays the latest available digital data. No attempt has been made to adjust the depths of the gross gamma logs to coincide with the SGLS data.

A plot of representative historical gross gamma-ray logs acquired between March 1975 and January 1990 is included. These historical gamma-ray logs can be used to identify the approximate time period in which anomalous gamma-ray activity was recognized in the borehole.